Claims

1. A method for producing a metal ion-specific capacity affinity sensor suitable for determining the presence of a certain heavy metal ion by capacitance measurement, comprising the steps of:

a) providing a piece of a noble metal, where said piece optionally can be a rod, or alternatively a piece of insulating material such as glass, silicon or quartz, on which a noble metal is sputtered or printed;

b) providing a first self-assembling monolayer-forming molecule comprising a coupling group;

c) contacting the piece in step a) with the first self-assembling monolayer-forming molecule in step b), thereby obtaining a self-assembling monolayer on said noble metal surface;

d) contacting said self-assembling monolayer on said noble metal piece with a molecule specifically binding said heavy metal ion, thereby coupling said molecule to the self-assembling monolayer;

e) contacting the piece obtained in step d) with a second Self-assembling monolayer-forming molecule, thereby obtaining a noble metal surface that is at least 90%, preferably at least 95%, more preferably at least 97%, and most preferably at least 99% covered with a self-assembling monolayer.

2. A method according to claim 1, characterized in that the coupling reaction in step d) is carried out in presence of PEGDGE.

3. A method according to claim 1, characterized in that the piece is exposed to a solution containing a crosslinking substance such as glutaraldehyde prior to step d).

4. A method according to claim 1, characterized in that the first self-assembling monolayer-forming molecule is D/L-thioctic acid, and in that said D/L-thioctic acid is activated with 1-(3-dimethylaminopropyl)-3-ethyl-carbodiimide before step d) is carried out.

5. A method according to claim 1, characterized in that the second self-assembling monolayer-forming molecule is a thiol comprising 3-25 carbon atoms in a straight saturated chain, and preferably is 1-dodecanethiol.

6. A metal ion-specific capacity affinity sensor comprising a piece of a noble metal, where said piece optionally can be a rod, or alternatively a piece of insulating material such as glass, silicon or quartz, on which a noble metal is sputtered, to which piece groups specifically binding to a certain heavy metal ion of interest have been bound characterized in that said groups specifically binding to said heavy metal ion are bound to a self-assembling monolayer covering at least 90%, preferably at least 95%, more preferably at least 97%, and most preferably at least 99% of the noble metal surface characterized in that said sensor has been produced by a method according to anyone of claims 1-6.

7. A sensor according to claim 6, characterized in that specifically heavy metal ion-binding groups are selected from the group of proteins having the sequences SEQ.ID.NO.1, SEQ.ID.NO.2, SEQ.ID.NO.3 or SEQ.ID.NO.4, or functional derivatives thereof having equivalent binding characteristics.

8. A method for qualitatively or quantitatively determining the presence of a certain heavy metal ion of interest in a liquid sample, comprising the steps of:

a) providing a sensor according to claim 6, wherein said affinity groups specifically binds to said heavy metal ion of interest;
b) contacting said sensor with a reference liquid not containing said heavy metal ion of interest and determining the capacitance according to per se known methods;
c) contacting said sensor with a sample suspected of containing said heavy metal ion and determining the capacitance according to per se known methods; and
d) calculating the difference between the capacitance of the sample and the capacitance of the reference sample, and optionally calculating the amount of said compound by using prerecorded calibration data.

9. A method according to claim 8 for determining the presence of ions selected from the group of Zn^{2+}, Hg^{2+}, Cd^{2+}, Cu^{2+}, and Pb^{2+}.

10. Use of a sensor according to claim 6 for determining the presence of of ions selected from the group of Zn^{2+}, Hg^{2+}, Cd^{2+}, Cu^{2+} and Pb^{2+}.